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Spruce Budworms Handbook

How To Protect Individual Trees From Western Spruce Budworm by Implants and Injections

In 1977, the United States Department of Agriculture and the Canada Department of the Environment agreed to cooperate in an expanded and accelerated research and development effort, the Canada/United States Spruce Budworms Program (CANUSA), aimed at the spruce budworm in the East and the western spruce budworm in the West. The objective of CANUSA was to design and evaluate strategies for controlling the spruce budworms and managing budworm-susceptible forests, to help forest managers attain their objectives in an economically and environmentally acceptable manner. The work reported in this publication was funded by the Program. This manual is one in a series on the western spruce budworm.

Canada
United States
Spruce Budworms
Program

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How To Protect Individual Trees From Western Spruce Budworm by Implants and Injections

by Richard C. Reardon[1]

Introduction

Damage caused by western spruce budworm larvae[2] can be minimized with chemical insecticides. Insecticides are aerially applied to suppress infestations over large areas; ground-operated equipment, implantation, and injection can be used to protect individual trees. Implantation and injection were not designed to replace ground or aerially operated spray equipment but to provide a portable, closed system that would minimize loss of insecticide and could be used in any weather, in remote or hard-to-reach places, and where adjacent areas might be sensitive to contamination (for example, residential zones, urban parks, and campgrounds). In both methods, the insecticide is carried in the sap to the buds and needles, which then become toxic to the larvae feeding on them.

Methods

Implantation and injection are the two methods described in this publication for protection of individual trees from western spruce budworm. Implantation is with Medicaps,[3] manufactured by Creative Sales, Inc., Fremont, NE 68025. Medicaps contain a dry chemical and are inconspicuous when used because the implants are driven completely into the trunk of the tree. Injection is with Mauget Systemic Injector Units, manufactured by J. J. Mauget Co., Burbank, CA 91504. Maugets contain an insecticide in liquid formulation and are obvious when in use because the chemical enters the tree from small, plastic reservoirs outside the trunk.

Medicap Implants

Medicaps are tubular plastic cartridges, 0.4 by 1 inch (1 by 2.5 cm), containing dry chemicals (fig. 1). A perforated hard plastic shell protects an encased gelatin capsule containing powdered insecticide. The cartridge is tapped into the woody tissue of the

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[2] For a description and illustration of the life stages and damage caused by western spruce budworm, see Fellin and Dewey (1982).

[3] The use of trade, firm, or corporation names in this publication is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by the U.S. Department of Agriculture of any product or service to the exclusion of others that may be suitable.

tree, and the sap dissolves and distributes the chemical.

Medicaps containing concentrated, technical acephate (Orthene), an organophosphate insecticide, are referred to as ACECAPS. ACECAPS are registered for control of spruce budworms (Environmental Protection Agency [EPA] reg. no. 37979-1). ACECAP 97, which is recommended for control of budworm, contains 97 percent technical acephate. ACECAP 97 cartridges contain 0.03 ounce (0.9 g) active ingredient (AI) of acephate; they cost about $1.25 and can be purchased in packages of 5, 10, or 25.

To control budworm on individual trees:

- Implant ACECAPS when most of the vegetative buds on the selected tree are beginning to swell. The timing is critical because about 20 days are required for lethal concentrations of acephate or its toxic metabolic-breakdown product methamidophos to move from the site of implantation to midcrown foliage. Only 10 days are required if trees are regularly watered and growing vigorously.
- Do not implant trees with trunk diameters (breast height) of less than 3 inches (8 cm). Injury occurs at the point of implantation, and small trees can be completely girdled.
- Determine the number of cartridges required by dividing the trunk circumference (at breast height) by four. Space holes evenly and implant a cartridge at about 4-inch (10-cm) intervals near the base of the trunk, 6 to 18 inches (15 to 45 cm) above the ground (fig. 2), preferably in the root-flare area.
- Using a hand brace and clean, sharp auger bit (fig. 3) or a battery-powered drill with a sharp spiral bit (⅜ inch, 1 cm), drill holes

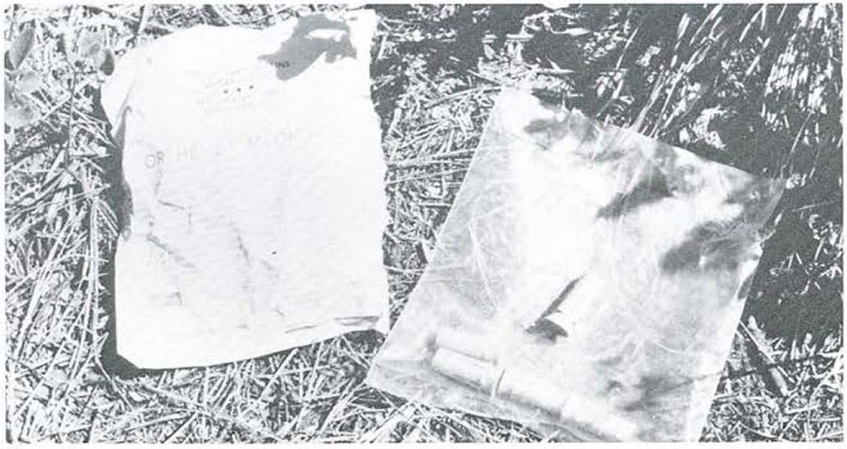

Figure 1 — Medicaps in sealed plastic pouch, with outer foil package.

Figure 2 — ACECAPS implanted 6 to 18 inches (15 to 45 cm) above the ground, one for about every 4 inches (10 cm) of trunk circumference.

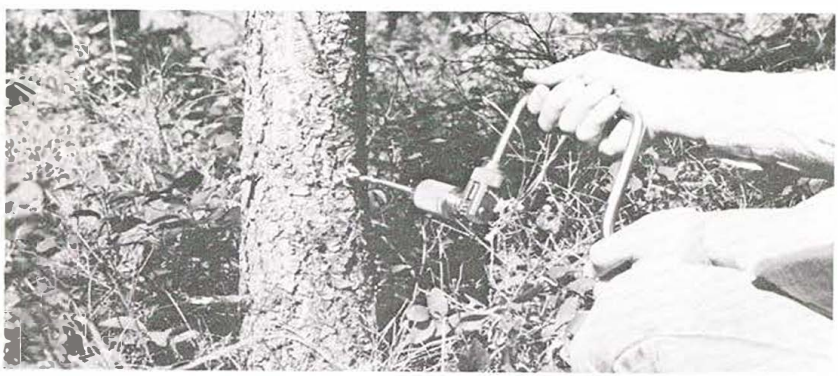

Figure 3 — Hand brace and auger bit used to drill holes into the woody tissue of the tree.

into the wood. The holes should be 1.3 inches (3.2 cm) deep, beyond the inner bark. For this purpose, the best battery-powered drills have fast-recharging power packs (such as the Black and Decker professional cordless ⅜-inch reversible drill no. 1941/9090, with fast-charge energy pack 98003/91009). Remove drill shavings from the holes.

Figure 4 — ACECAP inserted into hole drilled 1.3 inches (3.2 cm) beyond the inner bark.

- Insert a cartridge into each hole (fig. 4). Tap the cartridge with a bolt (or dowel) and hammer (fig. 5), so that the outer end of the cartridge is slightly beneath the bark layer. The cartridge seals the injection hole.
- To enhance chemical uptake, water around the tree before or immediately after implant treatment.
- Lethal concentrations of acephate and methamidophos persist for at least 66 days after implantation, and reduced concentrations of acephate have been recovered.
- Do not reuse the cartridges; they are designed to be left in the tree.
- Store unused ACECAPS in a cool, dry place.

Mauget Systemic Injector Units (Maugets)

No insecticide is currently registered for use with the Mauget injector system against the spruce budworms. Experiments with acephate show the system has promise for controlling budworm, and the Mauget Co. has petitioned EPA for registration. Because registration could occur at any time, the technique for using Mauget injectors is described.

Maugets consist of two parts, a body and a vial, both made of hard plastic 1.2 by 1.8 inches (3 by 4.5 cm). Liquid chemical is introduced into the trunk of the tree through small, plastic feeder tubes (fig. 6).

Figure 5 — Bolt and hammer used to tap the ACECAP to the desired depth in the woody tissue of the tree.

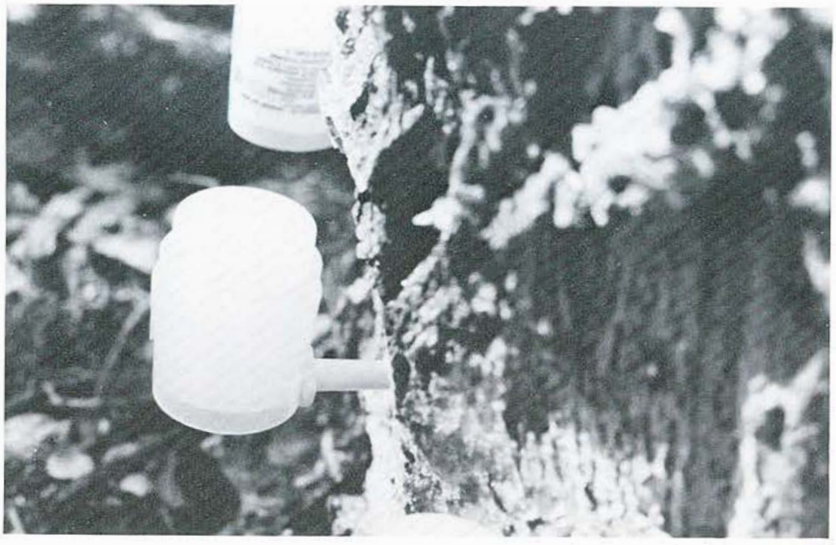

Figure 6 — Mauget systemic injection unit with feeder tube.

To control the budworm with injector units:

- Inject trees when most of the vegetative buds are swollen. When acephate was used experimentally, only about 5 days were required for lethal concentrations to reach midcrown foliage.
- Do not inject trees less than 4 inches (10 cm) in diameter.
- Determine the number of Maugets required by dividing the trunk circumference (at breast height) by six. Space holes evenly at about 6-inch (15-cm) intervals near the base of the trunk, 4 inches (10 cm) above the ground in the root-flare area.
- Drill holes for the feeder tubes at a slight downward angle with an 11/64-inch (0.44-cm) clean drill bit by a hand brace or battery-powered drill (fig. 7). A drilled hole is preferable to driving in the feeder tube, because the wounds close better and because the injected material is translocated more rapidly from the injection site. Remove drill shavings from the holes.
- Squeeze the body and the vial together by hand or step on them to pressurize the contents (about 8 lb/in^2, 3.6 kg/cm^2) and effect a leakproof seal.
- Using hand pressure (fig. 8), insert the hollow feeder tube, 3/16 inch (1/4 cm) in diameter and 2-3/4 inches (6.9 cm) long (standard) or 4-1/2 inches (11.3 cm) (for thick-bark trees), beveled end first, into the drilled holes to a depth of 3/8 inch (1 cm) into the xylem tissue.
- Place the collar notch in the flange of the feeder tube straight up; the bevel end will then be slanted at 45° (fig. 9).

Figure 7 — Battery-powered drill used to drill holes into the woody tissue for insertion of feeder tube.

Figure 8 — Feeder tubes inserted at about 6-inch (15-cm) intervals at the base of the tree.

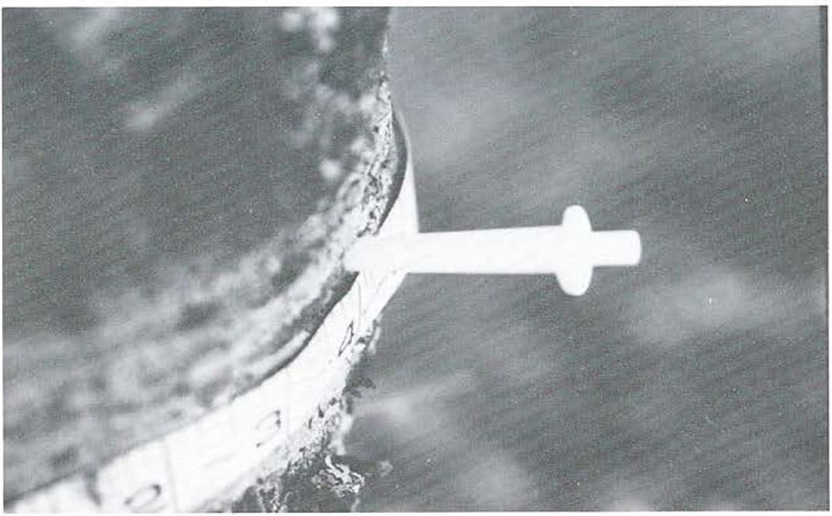

Figure 9 — Proper placement of plastic feeder tube with collar notch straight up.

Figure 10 — Attachment of pressurized plastic unit onto feeder tube.

- Set the tube depth carefully. If the feeder tube is set too deep, flow is restricted; if it is set too shallow, leaks may develop if the fluid is forced back through the bark.
- Turn the pressurized plastic unit upside down, with the connection hole at the top, and hand force or drive it with a plastic mallet onto the feeder tube (fig. 10). The tube will rupture an internal diaphragm.
- Turn the capsule right side up to allow the liquid contents to flow through the tube and into the tree (fig. 11).
- Allow the plastic unit to empty (usually 1 to 5 days).
- When the plastic unit is empty, revolve it on the feeder tube; pull the tube at the flange with pliers to remove the tube and plastic container, as a unit.
- Do not seal the injection hole.
- Do not treat trees under stress from lack of moisture or suffering from disease or herbicide damage.
- To increase systemic action, water the soil around the tree before or immediately after injection.

When the Mauget is used with acephate, each unit contains 0.06 ounce (1.75 g) AI. Pesticide residues persist for longer than 60 days in the tree. Maugets cost about $1.25 each, and they can be purchased in lots of less than 100 by special order. For additional information concerning their use, contact the J. J. Mauget Co.

Consecutive Yearly Applications

In general, Medicaps or Maugets afford protection for only the year of use. Injecting the same tree for two or more consecutive years would afford yearly protection, but would also increase the risk of damaging the tree. If trees are implanted or injected more than once, the holes for each treatment should be spaced above and between those made for the previous year (that is, not in a vertical line).

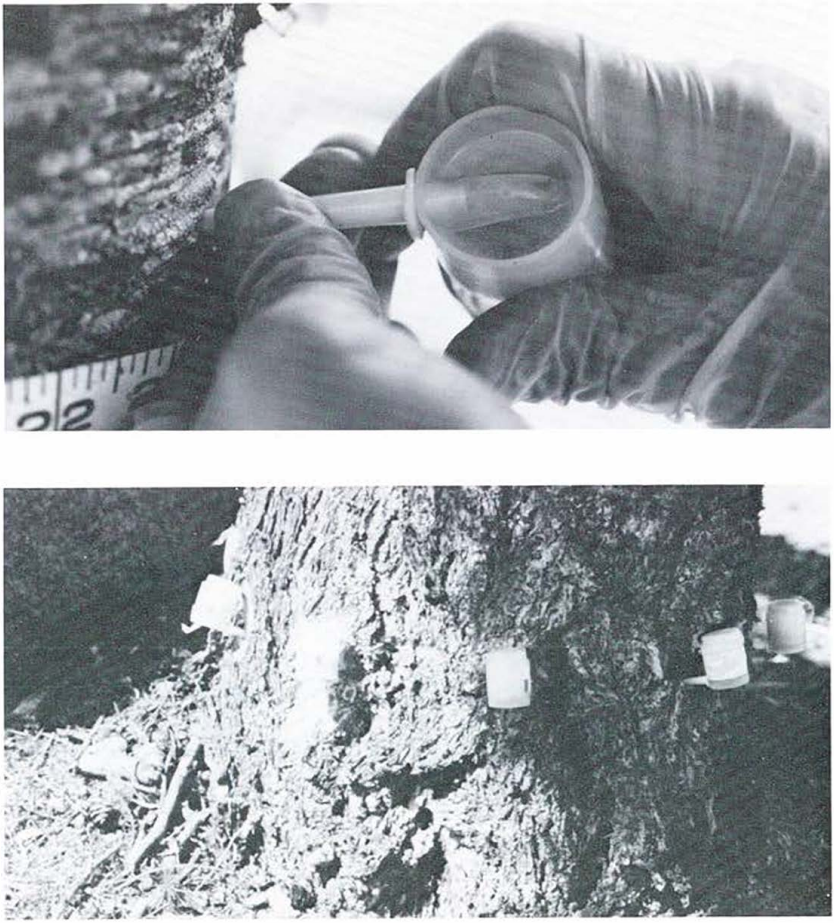

Figure 11 — Proper position of pressurized plastic units on feeder tubes for movement of insecticides from unit into the woody tissue of the tree.

Response of Trees to Wounds

Implanting and injection, including introduction of the insecticide and carrier into the tree, cause a discolored area around each drilled hole (fig. 12). These columns of discoloration might interfere with the upward movement of water in the wood; the degree of injury depends on many factors (for example, tree species, application procedures, and application timing). Correct application procedures are essential for best results and minimal wounding.

Figure 12 — Discolored wood associated with implantation site in grand fir.

The Methods Compared

Medicaps, with acephate, and Maugets (if acephate is registered) are both effective in protecting individual trees from damage by budworms. But the advantages and disadvantages of the two methods differ:

- Medicaps are registered for use against spruce budworms, are approved for use by individual homeowners, and do not require removal of the empty cartridge from the drilled hole. Lethal concentrations of acephate take 10 to 20 days to move from the site of implantation to the midcrown foliage.
- Maugets are not registered for use against spruce budworms, although the company has petitioned for registration. They require a smaller drilled hole than for Medicaps and only 5 days for lethal concentrations of acephate to move from the site of implantation to the midcrown foliage.

Safety

Although both Medicaps and Mauget Systemic Injection Units are closed systems, precautions on the labels should be followed. Keep children and animals away from the Maugets while the feeder tubes are in place. Proper disposal of the empty Mauget plastic units and feeder tubes, in accordance with State or local regulations, is essential.

Protective clothing such as gloves and face protectors are advisable but not required for handling, implanting, and injecting. Acephate is harmful if swallowed or absorbed through the skin. If you get any in your eyes, flush them with fresh water for at least 15 minutes. If irritation persists, call a doctor. If acephate is swallowed, give large amounts of water and induce vomiting if the victim is conscious. If you get acephate on your skin, wash with soap and water.

Literature Cited

Note to Physicians: Acephate is a cholinesterase inhibitor. If signs of cholinesterase inhibition occur, atropine is antidotal. 2-PAM may also be used in conjunction with atropine but should never be used alone.

Fellin, David G.; Dewey, Jerald E. Western spruce budworm. For. Insect Dis. Leafl. 53. Washington, DC: U.S. Department of Agriculture, Forest Service; **1982.** 10 p.

Pesticide Statement

Pesticides used improperly can be injurious to humans, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key — out of the reach of children and animals — and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife.

Do not apply pesticides when there is danger of drift, when honeybees or other pollinators are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the label.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first-aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or bury then in a level, isolated place.

Note: Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agricultural agent or State extension specialist to be sure the intended use is still registered. Use only pesticides that bear a Federal registration number.